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ABSTRACT

This agriculture extension service publication from Pennsylvania State University discusses the control of common grass and broadleaf weeds through the use of mulches and herbicides. The section on mulches discusses the different types of mulching materials, their advantages and disadvantages, herbicide-mulch combinations, and lists source of supply and usefulness of the various mulching materials. The section on chemical weed control discusses sprayer calibration, weed control programs, and herbicide safety. Also, this section contains tables that show weed succeptability to seven common herbicides, the application rates of these herbicides, and landscape plants that are tolerant to these herbicides. (MR)

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SE 024 730

College of Agriculture, The Pennsylvania State University, University Park, Pennsylvania

CONTROLLING LANDSCAPE WEEDS

Weed control in landscape plantings is a continuous problem to the landscape contractor. In a landscape, any plants other than those actually planned for the landscape development can be considered weeds. In some respects, this makes the task of defining the problem easier because there is no urgent need to make positive identification of particular weed species.

METHODS OF WEED CONTROL

Weed control in and around woody plants can be accomplished in two ways: chemically and mechanically. Depending on the particular situation, each method has its specific advantages as well as its disadvantages. Chemical weed control relies on a herbicide formulation which is toxic to plant growth. Mechanical control of weeds relies on a physical means of destroying the existing growth or preventing it from developing.

Several factors make weed control in a landscape planting unique from the control of identical weeds in a field situation with the same crop plants. In a landscape planting there are generally several crop plants involved in a given area. Each plant may have specific tolerances to various chemical materials, which severely limits the use of many herbicides.

The various types of soil conditions from one location to another can also have a direct bearing on the response of herbicide materials in plantings. Under field conditions where the exact soil situation can be determined, adjustments can be made in the application of a herbicide. However, in landscape plantings over a large area, the many kinds of soils require constant changing of materials, formulations, calibration of equipment, and application rates.

Another problem associated with the application of herbicides in landscape plantings is the overall shape of the area to be treated. Herbicides are best applied to uniform spaces with known surface areas. Even under optimum conditions it is often difficult to obtain uniform rates of application. This problem becomes even more critical when the surface area is unknown or difficult to determine. In the irregular areas of a landscape planting, an application of herbicide below the recommended rate would give poor or incomplete control of the weed. On the other hand, an application of herbicide above the recommended rate could result in serious crop injury or even loss of the entire planting. In either case, the customer would not be satisfied with the total results of the job.

It must be kept in mind, however, that there are advantages to the use of chemical herbicides where their application can be made uniformly and safely around the desirable plants. Where they can be used safely, the result can be reduced labor costs, improved plant quality by reducing root damage caused by improper weed-control cultivation, and a reduction in the competition between the plants and weeds for water and nutrients.

In view of the problems associated with the application of any herbicide material to the irregular landscape plant beds, mechanical weed control is safer and highly recommended. Of the two methods of mechanical control most widely used, howing and cultivation are probably the least satisfactory. The results of this method are only temporary because they will remove only the existing weed growth. On deep-rooted perennial weeds only the foliage layer is removed and regrowth is possible. These methods are time-consuming in relation to the overall effectiveness.

A more desirable method of mechanical weed control is the use of mulch materials. Mulch is basically a layer of peat moss, shredded bark, or any similar material spread on the surface of the soil under and around plants. Mulch materials are functional as well as aesthetic and can add to the appearance of the landscape planting.

MULCHES

VALUE OF MULCHES

The most common reason for using a mulch is that it will eliminate or at least retard weeds. Where the mulch layer is sufficiently deep, few weeds will grow. In addition to controlling weeds, mulches also aid the optimum development of the plants that grow in the mulched areas.

By retarding the amount of soil-water evaporation, mulches conserve moisture, which is particularly important during droughty periods of the growing season.

Mulches help maintain a uniform soil temperature. They act as an insulation to keep the soil warmer during cool spells and cooler during the warm months of the year. By maintaining uniform soil temperatures, freeze-thaw cycles during winter are retarded, and heaving of perennial plants is reduced.

As mulch materials gradually become mixed with the basic soil, they increase the water-holding capacity of light sandy soils and increase aeration of heavy clay soils.

Organic mulches serve as food for many microorganisms in the soil. During decomposition of the organic material, soil microorganisms secrete a sticky material which promotes the granulation of the soil. The mulch also maintains more stable temperatures so the activity of the microorganisms can prevail at an even rate.

Mulching aids in preventing surface soil erosion, particularly if the mulch has been established a few weeks.

APPLICATION OF MULCHES

The time to apply a mulch is in mid-spring when the soil has warmed up sufficiently for active root growth. Applied before this, the mulch will keep the ground cool and root growth slow. If planting is done in the fall, the mulch should be applied immediately so that the soil temperature will be kept warm longer.

Most mulches should be applied at least two to three inches deep over the whole area. Herbaceous plants which require winter protection may require an additional one to two inches in autumn around the crown or base of the plant.

When a mulch material is applied at the proper depth around plants, it can work to the plant's advantage. However, mulch material must not be in contact with the stem or trunk of the plant. Mulches of organic materials absorb and hold water in themselves as well as in the soil. This moist material around and in contact with the stem creates conditions favorable for the decomposition of the bark. The bark on most woody plants must be dry or at least be able to dry off rapidly after it becomes wet. Continued moisture on the trunk of the plant can be fatal.

PROBLEMS OF MULCHES

Weed seeds may be introduced into the landscape with hay, straw, and strawy manure and serve as a source of troublesome weeds. Various kinds of hulls or corn cobs may have grain or seed mixed in.

Molds often develop on cocoa bean and buckwheat hulls when they are kept too moist or in shady locations. Stirring the surface of the mulch to speed drying will help eliminate molds.

Several materials used for mulching require an addition of fertilizer to reduce the chance of nitrogen deficiency of the growing plants. Wood chips, sawdust, crushed corncobs, straw, and shredded bark need additions of fertilizer. A complete lawn or garden fertilizer can be used at the rate of 2 pounds per 100 square feet before applying the mulch. If the foliage of the plants becomes yellow during the growing season, additional fertilizer should be applied.

A problem with the use of some organic mulches, especially the fresh types that have not been composted or decomposed, is that they can heat up quickly once they become damp. This heat created by the decomposition process within the mulch layer can be enough to actually "cook" the bark or stem of the plant being mulched.

In the late part of the growing season, there is also the problem of proper hardening-off of the trunk at ground level. For the hardening-off process, some woody plants require that the entire stem be subjected to gradual temperature changes as the days become colder in the fall. When mulch material is covering the basal portion of the stem or trunk on a plant, the covered portion is not able to respond to the seasonal temperature change. What actually occurs is that the covered part is in the same condition as it was during the summer growing season; when the air temperature finally drops to the freezing point, this plant tissue is not ready for winter and can be injured or killed.

TYPES OF MULCHES

Sphagnum peat moss is generally available and ideal for mulching evergreens and other plants which grow best in acid soil. Its color is pleasing, it is free of weed seeds, and it remains effective for one to two years, depending on the thickness applied.

Shredded bark makes an excellent mulch which lasts as long as or longer than peat moss. Bark chunks are available in various sizes and are valuable in beautification.

Straw is used for winter protection and as a summer mulch in fruit and vegetable plantings. It is flammable and may carry weed seeds.

Crushed stone, gravel chips, and pebbles are excellent in the landscape for effect in highlighting plants or garden features. They are available in various colors and can be selected to blend with the features of the home, patio, or landscape.

Black polethylene is used primarily in vegetable gardens; both black and clear polyethylene are used in landscaping. The clear type should be covered with another mulch to prevent weed growth under the plastic film.

Crushed corncobs are used extensively in some areas but require supplemental fertilizer applications.

Buckwheat hulls are fine-textured and may blow in windy areas, but they have a pleasing neutral color and are long lasting.

Sawdust is commonly used where readily available. Nitrogen deficiency is almost certain, if fertilizer is not applied regularly. Wood chips or shavings decompose slowly and may need additional fertilizer.

Dark-colored, somewhat rotted sawdust is often preferable to the fresh product because of better appearance and lower nitrogen demand. When commercial sawdust is stored in large piles, moist sawdust becomes so compacted that aeration is excluded and anaerobic fermentation results. End products include volatile organic acids which accumulate in absence of free oxygen, and excessive heating which often causes charring or spontaneous combustion. Even if not charred, a dark-brown fermented sawdust is strongly acidic and has a pungent odor. If used for mulching it will kill many plants--not only seedlings, but also shrubs and young trees. Some of the fumes are volatile acids and will cause at least a yellowing of leaves or defoliation. Severity of injury depends on rate of application and weather conditions. Leaching by rain or irrigation accelerates root damage, and warm air temperature hastens evolution of fumes and results in rapid injury to leaves and tender plants.

Sour sawdust should never be used for mulches, potting mixes, or soil conditioners. The pungent, penetrating odor of any dark sawdust should provide sufficient warning against its use. To counteract the acidity, whether the sawdust is black or brown, requires 250 to 300 pounds of limestone per ton. On the other hand, fresh sawdust requires less than 10 pounds per ton; well-rotted sawdust, in which the rotting took place in the presence of air, may require 50 to 70 pounds of limestone to neutralize some acidity that develops even in the presence of free oxygen.

Fiberglass mats are inorganic and will not rot, corrode, or burn, and they are long lasting.

Salt hay, spent hops, lawn clippings, leaves, sugar cane, cocoa bean hulls, leaf mold and paper pulp have all been satisfactorily used for mulching and, if available, should be considered.

HERBICIDE-MULCH COMBINATIONS

When both a herbicide and a mulch material are combined for use in a landscape area, each product has advantages. It has been determined that a combination of selected herbicides and mulches can actually provide a better control of weed growth than either material used alone. The period of effectiveness is also extended by the combination of materials.

ADVANTAGES OF THE HERBICIDE-MULCH COMBINATION

Herbicide-mulch combinations can be applied immediately after the landscape job is completed. Landscape shrubs planted balled-and-burlapped or in containers will not be damaged by the herbicides.

There are many benefits to be gained from pre-mixing herbicides with mulches. Basically, weed control in planting beds is increased to a greater extent than when mulch or herbicides are used alone. Herbicide-mulch mixes permit easier distribution of the herbicides on small bed areas, and they reduce the landscape contractor's maintenance costs.

PREPARING AND APPLYING HERBICIDE-MULCH COMBINATIONS

The two herbicides which have been most effective in combination with mulch materials are Diphenamid (Dymid 80W or Enide 50W) and Dichlobenil (Casoron 4G or 50W). Both of these materials can be pre-mixed with coarse peat, cocoa hulls, licorice root, shredded bark, or sawdust.

CAUTION

Do not apply herbicide-mulch combinations in areas underplanted with ground covers or annuals and perennial flowers. Steep banks or areas where mulch can be moved by water should also be avoided.

In most cases the lowest herbicide rate provided will be adequate to control weeds in newly established plantings. The high rates are suitable for shade trees and established shrub borders where the plant roots are located at least several inches below the soil surface.

CROPS TOLERANT TO HERBICIDE-MULCH COMBINATIONS

Shrubs

Azalea*	Holly**	Privet
Barberry	Honeysuckle	Pyracantha
Boxwood	Japanese Andromedia	Rhododendron
Cherry Laurel	Juniper	Russian Olive
Cotoneaster	Leucothoe	Spirea
Euonymus	Lilac	Viburnum
Flowering Quince	Mock Orange	Yew
Forsythia	Photinia	

* Hardy hybrid and native species only.
** Except I. crenata and I. rotunda

Trees

Ash	Elm	Maple	Sweet Gum
Crabapple	Goldenrain	Oak	Tulip Tree
Dogwood	Honeylocust	Sycamore	

HERBICIDES TO BE USED WITH MULCHES

Herbicide	Rate	Remarks
Dichlobenil 4G		
4 pounds active ingredient per acre	57 grams (19 teaspoons or 2 ounces) mixed with 9 cubic feet of mulch	Slightly moisten the mulch material before applying the herbicide. Thoroughly mix herbicide with mulch and then store in large plastic bags or in air-tight containers until use. Nine cubic feet* of mulch will cover approximately 54 square feet 2 inches deep.
to		
6 pounds active ingredient per acre	85 grams (28 teaspoons or 3 ounces) mixed with 9 cubic feet of mulch	
Dichlobenil 50W		
4 pounds active ingredient per acre	4.5 grams (1 1/2 teaspoons) mixed with 9 cubic feet mulch	Mix herbicide with water (2 quarts of water will be sufficient) and apply to mulch. This can be accomplished in one of two ways: (1) Thoroughly impregnate mulch before it is applied; store until ready for use. (2) Apply a one-inch layer of mulch (54 square feet.) Apply herbicide on top of the mulch with a sprayer and then spread an additional one-inch layer of mulch on top of the treated area.
to		
6 pounds active ingredient per acre	6 grams (2 teaspoons) mixed with 9 cubic feet	
Diphenamid 50W		
4 pounds active ingredient per acre	4.5 grams (3 teaspoons) mixed with 9 cubic feet of mulch	Same as Dichlobenil 50W
to		
6 pounds active ingredient per acre	6 grams (1 1/2 teaspoons) mixed with 9 cubic feet of mulch	

* 1.25 cubic feet is equal to 1 bushel.

Herbicide	Rate	Remarks
Diphenamid 80W		
4 pounds active ingredient per acre	2.5 grams (1 1/2 teaspoons) mixed with 9 cubic feet of mulch	Same as Dichlobenil 50W
to		
6 pounds active ingredient per acre	4 grams (2 1/2 teaspoons) mixed with 9 cubic feet of mulch	

LIVING MULCHES

Living mulches are exceptionally fine for established shrub beds, hedges, garden areas, or among young evergreens and new plantings. The following plants are considered good for living mulches: euonymus (in variety), hardy English ivy, periwinkle, honeysuckle, Japanese spurgo, ajuga retans, dwarf mountain pink (phlox subulata), snow-in-summer, bedding petunias, California poppy, sweet alyssum, sedums (in variety), and native ferns.

During the excessive heat of the summer sun, plants tend to dry up, but the mulches around the base of the plants in question serve to preserve the moisture. In the winter, the evergreen mulches keep frost in the ground and prevent the alternate freezing and thawing damage which usually occurs during February and March.

MULCHES FOR HOME GROUNDS

Material	Source of Supply	Comment
Aluminum foil	Nurseries, garden supply centers, grocery and department stores	Can be used for two years. Rather conspicuous in appearance.
Asphalt	Paving construction contractors, some lumberyards	Very light application used to keep soil in place until grass gets started. Used primarily on steep banks.
Asphalt paper	Building supply dealers, hardware stores, garden supply houses	Rarely used.
Buckwheat hulls	Farmers, garden centers, nurseries	Excellent--has fine texture, good color, and long life. Used for ornamental plantings.
Cocoa-bean hulls	Candy and chocolate manufacturers	Good color, fine texture. Mix with well-decomposed hardwood sawdust--2 to 1 ratio.
Corncobs (ground)	Midwestern states, some garden supply houses, farmers	Considered good although appearance is not exceptional.
Cornstalks	Cornfields--after harvesting	May harbor insects and diseases. Used to hold down other mulches.
Crushed gravel or stone	Lumberyards, building contractors, some nurserymen and garden centers	Used primarily for rock-garden or alpine plantings. Some home owners adapt it to planting areas.
Hay	Feed stores, farms	Nitrogen supplied by decaying leguminous hays, such as clover and alfalfa. Regular hay favored.
Hops (spent)	Beverage manufacturers	Odor objectionable. Light color. Fire resistance excellent.
Lawn clippings	Home owners' lawns	Excerise care in use. Green clippings generate heat quickly.

Material	Source of Supply	Comment
Leafmold	Obtained from woods. Can be composted from leaves collected in fall.	Excellent for wildflowers. Also good for general garden use.
Leaves	Deciduous tree leaves	Leaves should be composted. Oak leaves excellent for ericaceous plants. Avoid maple and poplar leaves as they tend to become matted.
Manure (strawy)	Stables and farms	Fresh manure will burn. Does provide limited amount of nutrients.
Mushroom manure (spent)	Commerical mushroom growers	Limited nutrient value. Dark in color.
Paper pulp	Can be homemade from old newspapers and well-decomposed hardwood sawdust	Special mixer needed to prepare properly. Used for large areas.
Peanut hulls	Local peanut candy manufacturers	Good mulch but not too attractive. Could contain nematodes.
Peat moss and humus	Garden centers, hardware stores, florists, grocery and department stores, nurseries	Must be kept moist; drys quickly. Good color, fine texture. Excellent.
Pine needles (Other coniferous types)	Where pines grow; other types of cone-bearing evergreens	Generally useful for wild gardens. Also adaptable for other plantings.
Plastic film	Garden centers, department stores, nursery and florist establishments	Can be used for large areas. Not attractive for ornamental planting areas.
Salt hay	Garden supply houses, some nurseries, seashore areas	Considered excellent general mulch.
Sawdust	Lumberyards, sawmills, or where other wood-working operations occur	Well-decomposed types of hardwood sawdust considered best. Will tend to cause nitrogen deficiencies which can be corrected by proper fertilization (nitrogen additives). Excellent as general mulch.

Material	Source of Supply	Comment
Seaweed (kelp, etc.)	Seashore areas	Considered good. Not good for ornamental plantings due to appearance. Adds mineral elements to soil.
Straw	Farms, feed stores	Considered durable. Coarse in texture.
Tobacco stems (chopped)	Tabacco growing areas	Coarse in texture. Tends to discourage insect enemies.
Wood chips	Local utility maintenance operations; if chipper is available, can be made from prunings	Excellent way of disposing of branches, small twigs and tree limbs. Excellent mulch. Nitrogen deficiency less than when sawdust is used.

CHEMICAL CONTROL OF WEEDS

The following principles should be understood and applied if maximum benefits are to be gained from chemical weed control methods.

1. Herbicides kill best when applied at the proper stage of weed growth. In general, herbicides applied to a clean cultivated area give the most effective results in controlling nursery weed problems.

2. Soil moistures affect herbicides action. Good results depend on having enough moisture in the soil to activate the chemical to kill weed seedlings.

3. Proper rates of chemicals are important. The amount of material used will vary with the soil type. Heavier soils require higher rates than lighter sandy soil conditions. In all cases weed control materials and equipment should be carefully calibrated before applying herbicides to nursery stock.

4. Know the chemical and its limitations. Herbicides are quite specific for control of certain weed species. Proceed with CAUTION when using weed killers. Read package labels carefully, follow directions and proceed only on a trial basis. Remember, an error can be costly.

METHODS OF APPLYING HERBICIDES

There are two basic methods used in applying herbicides: surface application and soil incorporation.

Soil application places the chemical on the soil surface and requires moisture to carry the chemical into the soil. Usually higher herbicide rates are required when using surface applications, but the herbicide can be applied closer to the plant without causing injury. Since weeds in the crop row are usually the hardest to control, it may reduce costs up to 75 percent to band treat just the plant row rather than cover the entire field area. Band treatments will mean that areas between the rows will need cultivation; however, this practice will greatly facilitate the entrance of moisture from irrigation or rain and result in less water loss from excessive runoff.

Soil incorporation places the chemical in the soil where the germinating weed seeds are. The effectiveness of many herbicides have been increased by incorporating them into the soil. Mixing the chemical into the soil provides a longer period of acceptable weed control. More herbicide is generally required, but reliable weed control less dependent on natural weather conditions is obtained.

The herbicide should be incorporated immediately into the soil to prevent herbicide loss due to volatilization and photodecomposition.

For more effective results the herbicide should be applied to loose or cultivated soil. The herbicide should be mixed into the soil at the time of application or immediately afterwards. Thorough mixing in the top 2 to 4 inches of soil, and not merely scratching or raking in, is necessary. Rotary tillers have been found to be the most effective. Tandem disc harrows have also done a good job when cross disced. For difficult-to-control perennial weeds it is necessary to incorporate to a depth of 6 inches.

PRECAUTIONS

Read and follow the label on the herbicide container. Check labels for proper storage temperatures of various chemicals. Store herbicides and dispose of empty containers so they are no hazard to man or animals and are inaccessible to children. Do not contaminate streams, ponds, or other water sources.

CALIBRATION OF WEED CONTROL EQUIPMENT
SPRAYERS

It is extremely important to accurately calibrate any equipment or granular applicators to determine the amount of material being applied per acre. The following steps illustrate a method for calibrating a sprayer:

1. Fill the sprayer with water only.

2. Spray a measured area, in a field if possible, at a fixed tractor speed and pressure-gauge setting.

3. Measure the amount of water necessary to refill the sprayer.

4. Multiply the number of gallons used in the measured area by 43,560 (number of square feet in an acre). Then divide the product by the number of square feet covered in the measured area. This will give the gallons-per-acre rate.

5. Mix the amount of chemical desired per acre with water to give this much spray material.

For example, if 1 gallon of water was used to spray an area 10 feet wide by 100 feet long, the volume of spray material applied per acre would be 43.5 gallons. If you wish to apply 12 pounds per acre of Casoron 50W (6 pounds active) and you have a 100 gallon tank, you would add 27.6 pounds of Casoron 50W to the tank to obtain the desired rate. This is how the total was calculated:

$$\frac{43,560 \times 1}{1000} = 43.5 \text{ gallons per acre.}$$

If you have a 100 gallon tank, this is the next step:

$$\frac{100}{43.5} = 2.3 \text{ acres to be sprayed per tank.}$$

If the suggested rate of application is 12 pounds of herbicide per acre, do this calculation:

2.3 x 12 = 27.6 pounds Casoron 50W needed per tank to give 6 pounds active ingredient per acre rate.

If you change the speed, gauge pressure setting, nozzle size or number of nozzles, the amount of liquid per acre will also change and recalibration will be necessary.

GRANULAR DISTRIBUTORS

Calibrating granular distributors of the hand-operated or tractor-operated, cyclone type is more difficult than calibrating a sprayer. To get the most accuracy, calibration must be done with the actual material and under field operating conditions.

Approximately 440 square feet (one hundredth of an acre) is suggested as a test strip. Weigh the chemical you start with and weigh what you have left after the trial run. Subtract that from the original. The difference

between the two is the amount used, which should be multiplied by 100 to get the amount per acre. You will then have to make adjustments of equipment and repeat your tests until the proper adjustment is made for the required amount per acre.

Useful Conversion Factors

1 acre	=	43,560 sq ft
2 cups	=	1 pint
1 cup	=	237.5 ml
1 cup	=	16 level tablespoons
16 ounces	=	1 pint (liquid)
16 ounces	=	1 pint (dry)
1 tablespoon	=	3 level teaspoons
1 fluid ounce	=	2 tablespoons

PROGRAMMED WEED CONTROL FOR NURSERY STOCK

Pre-Plant Beds	Pre-Plant Field	Lining-Out Stock* Beds or Field	Established Stock* Field
		SPRING OR SUMMER	
Metham (Vapam) Vorlex Methyl Bromide	Trifluralin (Treflan)	Diphenamid (Dymid or Enide) EPTC (Eptam) Chloramben (Amiben) DCPA (Dacthal)	Simazine (Princep) Dichlobenil (Casoron) Diphenamid (Dymid or Enide) EPTC (Eptam) Chloramben (Amiben) DCPA (Dacthal)
		FALL OR WINTER	
Vorlex		Diphenamid (Dymid or Enide)	Simazine (Princep) Dichlobenil (Casoron) Diphenamid (Dymid or Enide)
		SPRING OR SUMMER (AREA TREATED PREVIOUS FALL)	
		Diphenamid (Dymid or Enide) Chloramben (Amiben) DCPA (Dacthal)	Diphenamid (Dymid or Enide) Chloramben (Amiben) DCPA (Dacthal)

*Herbicides listed are ranked in order of their residual activity in the soil Those at the top of each list have the longest residual life. The residual activity determines the length of weed control which can be expected from a herbicide. In most cases, it is best to select a herbicide which has the longest residual life, providing it has clearance on the specific ornamental plants where its use is intended and the area treated will not be used for another crop before the residual has dissipated.

WEEDS CONTROLLED BY SELECTED HERBICIDES

The following is a guide to those weed species controlled by selected herbicides. An (X) appearing in the column below the name of a herbicide indicates the herbicide will control the specific weed species appearing in the column to the left of the (X). In all cases, with the exception of a few perennial weeds, the weeds listed are controlled in the early stage. Therefore, areas to be treated with a herbicide must be clean cultivated before the herbicides are applied.

ANNUAL WEEDS Common Name	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam
Amaranth, Spiny				X	X		
Barnyardgrass				X	X	X	X
Bluegrass, Annual		X	X	X	X	X	X
Carpetweed		X	X	X	X	X	
Cheat				X	X	X	
Chickweed, Common	X	X	X	X	X	X	X
Cocklebur							
Crabgrass,	X	X	X		X	X	X
Crabgrass, Large				X			
Crabgrass, Smooth			X	X			
Crowfootgrass				X			
Dandelion		X					
Evening primrose		X					
Fireweed					X		
Foxtail	X	X			X	X	
Foxtail, Giant				X			
Foxtail, Green			X				X
Foxtail, Yellow			X	X			X
Goosefoot				X		X	X
Goosegrass			X		X	X	
Groundsel		X					
Henbit		X					X
Knotweed		X		X		X	
Kochia	X					X	
Lambsquarters Common	X	X	X	X	X	X	X
Lettuce, Prickly					X		
Morning-glory, Annual					X		X
Mustard	X	X					
Nettle, Stinging						X	
Nettleleaf Goosefoot							X
Nightshade					X		X
Oats, Wild					X		X
Panicum, Fall	X		X	X			
Pepperweed, Virginia		X		X			
Pigweed	X				X	X	
Pigweed, Prostrate		X					
Pigweed, Redroot		X					X

ANNUAL WEEDS Common Name	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam)
Pigweed, Tumble							X
Plantain		X					
Purslane, Common		X	X	X			X
Ragweed	X	X					
Ryegrass				X	X		X
Sandbur, Field				X		X	X
Shepherdpurse		X					
Smartweed	X	X		X	X		
Sorrel, Red				X			
Sprangletop						X	
Spurge		X					
Stinkgrass						X	
Thistle, Russian		X					
Velvetleaf	X						
Witchgrass			X	X	X		
PERENNIAL WEEDS							
Aster		X					
Carrot, Wild		X					
Dock, Curly		X					
Horsetail		X					
Johnsongrass	X		X	X		X	X
Orchardgrass		X					
Nutsedge, Purple							X
Nutsedge, Yellow							X
Quackgrass		X					
Rocket, Yellow		X					
Spurge, Leafy		X					
Thistle, Canada		X					
Timothy		X					
Wormwood, Absinth		X					

SUGGESTIONS FOR CHEMICAL WEED CONTROL

NURSERY BEDS (PRE-PLANT TREATMENT)

CHEMICAL	WEEDS CONTROLLED	TREATMENT RATE
Metham (Vapam)	Nematodes, most weeds and fungi	1 quart mixed with 2 gallons of water will treat 100 square feet

Remarks: Soil temperature must be in the range of 50° to 90° F. at a 3-inch depth at time of treatment. Before application, cultivate area to be treated, breaking up clods and loosening soil deeply. Cover area treated with plastic or tarp for 48 hours or sprinkle treated area with water until soil is sealed. Do not plant for 2 to 3 weeks after treatment.

Vorlex	Nematodes, most weeds and fungi	3/4 to 1 pint per 100 square feet

Remarks: Cultivate soil and be sure it is moist before treatment. Inject material into soil to a 4- to 6-inch depth with a chisel or blade applicator. Immediately after application, drag treated area to remove chisel marks. Treated area can be planted after 7 days if soil temperature is above 60° F. A longer period will be necessary if soil temperature is below 60° F.

Methyl bromide	Nematodes, most weeds and fungi	1 to 2 pounds per 100 square feet

Remarks: Soil to be treated should be worked into seed-bed condition before treatment. Soil temperature must be above 60° F. at time of treatment. Cover bed with gas-proof cover and discharge methyl bromide under cover. Allow 24 hours after treatment before removing cover. Can be planted in 2 days.

FIELDS (PRE-PLANT TREATMENT)

Trifluralin (Treflan 4E or 5% G)	Most annual weeds	1 quart in 25 gallons or more of water per acre or 20 pounds of 5% granular material per acre

Remarks: Apply to clean-cultivated, weed-free area. Incorporate immediately into soil to a depth of 2 to 4 inches by double-discing. Area can be planted within a few days after treatment.

CHEMICAL	WEEDS CONTROLLED	TREATMENT RATE

BEDS OR FIELDS (LINING-OUT STOCK)

Diphenamid (Dymid 80 W or 5% G or Enide 50 W)	Most annual weeds except ragweed	5 to 7½ pounds Dymid wettable powder, or 80 to 100 pounds of 5% granular Dymid, or 8 to 12 pounds of Enide wettable powder per acre

Remarks: Apply after first irrigation or as soon as the soil has settled. Area to be treated must be free of weed growth.

EPTC (Eptam 6E or 5% G)	Most annual weeds quackgrass, nutsedge, chrysanthemum weed	One gallon of 6E in 20 to 40 gallons of water, or 120 pounds of granular material per acre

Remarks: Apply after growth starts in the spring or two weeks after transplanting. Immediately after application, thoroughly mix into soil to a depth of 2 to 3 inches; or water in. Area to be treated must be clean cultivated.

Chloramben (Amiben 4% or 10% G)	Most annual weeds	100 pounds of 4% granular or 40 pounds of 10% granular material per acre

Remarks: Broadcast on clean-cultivated beds six weeks after planting.

DCPA (Dacthal 75W)	Most annual weeds except smartweed and ragweed	14 to 16 pounds in 100 gallons of water per acre

Remarks: Apply immediately after transplanting. For seasonal weed control a second application will be needed in late June or early July. Area to be treated must be clean cultivated.

ESTABLISHED STOCK

Simazine (Princep 80W or 4% G)	Most annual weeds	2½ to 5 pounds of 80W in 20 to 40 gallons of water or 50 to 100 pounds of 4% granular material per acre

Remarks: Apply only to nursery stock established at least one growing season. Area to be treated must be clean cultivated.

CHEMICAL	WEEDS CONTROLLED	TREATMENT RATE
Dichlobenil (Casoron 4% G)	Most annual and some perennial weeds	100 to 150 pounds of granular material per acre

Remarks: Apply during late fall or early spring. Area to be treated must be clean cultivated. Do not apply near Ilex crenata or Ilex rotunda.

Diphenamid (Dymid 80W or 5% G or Enide 50W)	Most annual weeds except ragweed	5 to 7½ pounds Dymid wettable powder, or 80 to 120 pounds of 5% granular Dymid, or 8 to 12 pounds of Enide per acre

Remarks: Area to be treated must be clean cultivated.

EPTC (Eptam 6 E or 5% G)	Most annual weeds, quackgrass, nutsedge, and chrysanthemum weed	One gallon of 6 E in 20 to 40 gallons of water, or 120 pounds of granular material per acre

Remarks: Apply after growth starts in the spring or two weeks after transplanting. Immediately after application, thoroughly mix into soil to a depth of 2 to 3 inches, or water in. Area to be treated must be clean cultivated.

DCPA (Dacthal 75W)	Most annual weeds except smartweed and ragweed	16 pounds in 100 gallons of water per acre

Remarks: Area to be treated must be clean cultivated.

Chloramben (Amiben 4% or 10% G)	Most annual weeds	100 pounds of 4% granular or 40 pounds of 10% granular material per acre

Remarks: Area to be treated must be clean cultivated.

Dalapon (Downpon 75W)	Quackgrass	15 to 20 pounds in 30 gallons of water per acre

Remarks: Treatment must be made before field is planted. Fall treated land may be planted to crops the following spring. Mow field and apply when regrowth is 4 to 10 inches tall. Plow under two weeks after treatment.

Dichlobenil (Casoron 4% G)	Quackgrass	200 pounds of granular material per acre

Remarks: Apply during late fall or early spring for most effective control. Only treat crop areas which are tolerant to casoron. Do not use more than 150 pounds of casoron on areas planted to azalea, boxwood, euonymus, forsythia, heather, holly, ivy, lilac, or leucothoe.

CHEMICAL	WEEDS CONTROLLED	TREATMENT RATE
Paraquat	Kills emerged annual broadleaf weeds and grasses, and topkills and suppresses perennial weeds	1 to 2 quarts plus surfactant in 50 to 100 gallons of water per acre.

Remarks: Use on non-crop areas or in the interspaces or around the base of trees. Apply when weed growth is succulent and between 1 and 6 inches high. A non-ionic surfactant added to the herbicide will increase the effectiveness. Material is injurious to respiratory organs. Do not breathe mist.

PLANTS TOLERANT TO APPLICATIONS OF SELECTED HERBICIDES

TREES Common Names	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam)
Amur Corktree		X					
Ash		X	X				
Ash, White	X			X		X	
Bald Cypress				X		X	
Birch		X	X				
Birch, European				X		X	
Black Gum				X		X	
Black Locust				X		X	
Box-Elder		X			X		
Chinese chestnut				X		X	
Cottonwood		X	X	X		X	
Crabapple		X	X	X		X	
Dogwood	X	X	X	X	X		X
Dogwood, Flowering				X		X	
Dogwood, Japanese						X	
Eastern red cedar		X		X	X	X	
Elm		X	X				
Elm, American					X		
Elm, Siberian					X		
Fir			X				X
Fir, Balsam				X	X	X	
Fir, Douglas				X	X	X	
Fir, Fraser					X		
Golderrain tree		X					
Hackberry		X					
Hawthorn			X				
Hemlock	X				X		X
Hemlock, Canada				X		X	
Hickory	X						
Honeylocust		X	X	X	X	X	
Japanese Larch				X		X	
Linden		X					X
London Plane Tree				X		X	
Magnolia	X	X	X				X
Maple		X	X				X
Maple, Norway				X		X	
Maple, Red	X			X		X	
Maple, Silver				X		X	
Maple, Sugar				X		X	
Mountain ash		X					

TREES Common Names	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam)
Oak		X	X				X
Oak, Pin				X		X	
Oak, Red	X			X	X	X	
Oak, Scarlet				X		X	
Pine	X	X	X				X
Pine, Austrian				X	X	X	
Pine, Japanese Black				X		X	
Pine, Red				X	X	X	
Pine, Scotch				X	X	X	
Pine, White				X	X	X	
Poplar		X	X				
Redbud			X			X	
Russian Olive		X	X		X		
Sassafras	X						
Spruce			X				
Spruce, Blue				X	X	X	
Spruce, Norway				X	X	X	
Spruce, White				X	X	X	
Sweetgum				X		X	
Sycamore			X	X		X	
Tuliptree			X	X		X	
Walnut			X	X		X	
Willow		X	X	X		X	
DECIDUOUS SHRUBS							
Abelia			X				
Azalea	X		X				
Azalea, Hiryu		X		X		X	
Azalea, Indian				X		X	
Azalea, Mollis		X					
Barberry		X	X	X	X	X	X
Beauty bush		X					
Cinquefoil				X		X	
Cotoneaster	X	X			X		
Cotoneaster, Spreading				X		X	
Currants				X			
Deutzia		X	X	X		X	

Common Names	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam)
DECIDUOUS SHRUBS							
Euonymus	X	X	X	X			X
Euonymus, Winged				X		X	
Flowering Almond		X					
Flowering Quince		X					
Forsythia		X	X	X		X	
Honeysuckle		X	X	X	X	X	
Hydrangea			X	X			
Lilac		X	X				X
Lilac, Common				X		X	
Mockorange		X					
Mockorange, Lemoine				X		X	
Nandina		X					
Photinia		X					
Privet		X	X	X		X	
Rose		X	X	X		X	
Spirea	X	X	X				
Spirea, Vanhoutte				X		X	
Viburnum	X	X	X				X
Virurnum, Doublefile				X		X	
Weigela		X	X	X		X	
EVERGREEN SHRUBS							
Aborvitae	X	X	X		X		
Arborvitae, American				X		X	
Boxwood	X	X	X	X		X	X
Cherry Laurel				X		X	
Euonymus		X					X
Firethorn		X		X		X	
Holly	X	X	X				X
Holly, Burford							
Holly, Japanese				X		X	X
Japanese Pieris	X		X	X		X	X
Juniper	X	X	X		X		X
Juniper, Chinese				X		X	
Juniper, Shore				X		X	
Leucothoe		X					X
Mountain Laurel		X	X	X		X	
Mugo Pine					X		
Oregon Holly grape					X		

Common Names	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam)
EVERGREEN SHRUBS							
Osmanthus		X					
Pachistima		X	X				
Rhododendron	X	X	X				X
Yew	X	X	X		X	X	X
Yew, Dense				X			
Yew, Japanese				X		X	
Yew, Media				X		X	
GROUND COVERS AND VINES							
Bugle-weed							X
Creeping Thyme							
Daylily	X						X
Heather, Scotch		X					
Ivy, English	X	X	X				X
Ivy, Baltic			X				
Ivy, Wilson			X				
Pachysandra			X				X
Periwinkle							
Stonecrop			X				X
Wintercreeper	X			X		X	
ANNUAL & PERENNIAL FLOWERS							
Achillea						X	
Ageratum			X			X	X
Alyssum			X			X	X
Arctotis						X	
Aster			X	X		X	X
Babysbreath			X			X	
Balsam			X			X	
Bellflower			X			X	
Bleeding Heart			X				
Bloodleaf			X				
Bugloss			X				
Calendula						X	
Calliopsis						X	
Candytuft			X				
Carnation						X	X

ANNUAL & PERENNIAL FLOWERS

Common Names	Chloramben (Amiben)	Dichlobenil (Casoron)	DCPA (Dacthal)	Diphenamid (Dymid or Enide)	Simazine (Princep)	Trifluralin (Treflan)	EPTC (Eptam)
Celosia	X						
Centaurea						X	
Chrysanthemum	X		X	X		X	
Coleus			X				
Columbine			X				
Coral bells			X				
Coreopsis			X				
Cosmos			X			X	
Cuphea			X				
Dahlia			X			X	
Daylily	X						X
Delephinium			X				
Evening primrose			X				
Forget-me-not			X			X	
Gaillardia			X			X	
Geranium			X			X	
Gladiolus			X			X	
Gold Dust			X				
Iris	X		X				
Lily			X				
Lobelia						X	
Lupines			X			X	
Marigold	X		X	X		X	X
Morning Glory			X			X	
Nasturtium			X			X	X
Nicotiana						X	
Pansy							X
Peony	X		X				
Petunia			X	X		X	X
Phlox				X		X	
Portulaca						X	
Rudbeckia						X	
Salvia			X	X		X	
Scabiosa						X	
Shasta daisy				X		X	
Shapdragon	X		X	X		X	
Stock				X		X	
Sunflower			X			X	
Sweet Pea			X			X	
Sweet william				X		X	
Zinnia	X		X	X			X

REFERENCES

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